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The Aggregate Consumption Puzzle In Singapore

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Abstract: We draw attention to an apparent puzzle in the aggregate consumption behaviour of Singaporeans. In stark contrast to the rest of the world, the average propensity to consume has plummeted to a record low of two-fifths of income in 2000 leaving the economy without a good built-in stabilizer. This phenomenon is a notable departure from the stable long-run equilibrium relationship between consumption, disposable income and wealth observed elsewhere. The explanation of this puzzle is the main focus of the paper but we also draw attention to some policy measures that may reverse the process.

JEL classification: C52, E21

Keywords: consumption function; average propensity to consume; cointegrating relation; asset price inflation

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1. Introduction

Despite the fact that the aggregate consumption function is one of the most well established and widely estimated relationships in macroeconomics, there is no rigorous published study of such a function for Singapore.[1] In an attempt to fill this gap, we encountered a major anomaly viz., a substantial fall in the average propensity to consume (APC) over time. When the APC is measured as the ratio of private consumption expenditures to GDP, it has fallen steadily over time from 0.82 in 1960 to 0.39 in 2000 (Figure 1). This has produced the lowest ratio of private consumption to output in the free world; even among the former centrally planned economies, Ermisch and Huff (1999) noted that the lowest share of private consumption ever reached in the Soviet Union was 55%. The dramatic decline in the APC seems to have left the Singapore economy without a dependable built-in stabilizer. One wonders whether the increased amplitudes of Singapore's business cycles in recent years is partly a consequence of the weakening of this stabilizer, in addition to the increased volatility of external demand.

The long-term decline in the APC is puzzling and anomalous because since Simon Kuznets's (1946) pioneering work, it was observed that the APC is relatively stable in the long run. The post-war evidence on selected economies bear out this remarkable fact: Table 1 shows that the shares of private consumption in GDP of the United States and United Kingdom have hovered around two-thirds from 1960 to 1990, notwithstanding their slight tendency to drift upward in the last two decades. In Asia, Japan saw its APC falling during the 1960s but the ratio has stabilized since then; this dynamic path is mirrored by the NIE's of Taiwan and Hong Kong and probably reflects the demographic transitions that occurred in these countries. Switzerland, a mature industrialized economy, is perhaps the best comparison for Singapore in view of its smallness and openness. As Singapore reaches a mature stage of development like Switzerland, one would have expected its APC to show signs of stabilizing like the Swiss APC. This, however, has not happened so far.

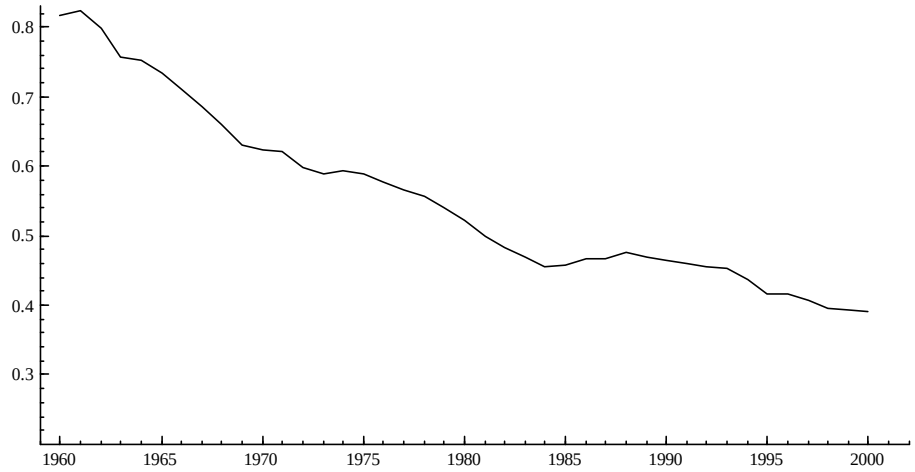
Historically, the life-cycle and permanent income hypotheses were formulated precisely to explain the stylized fact of a constant APC, as the simple Keynesian consumption function had predicted that the APC should decrease over time with increases in income. Essentially, these explanations pointed out the key role played by wealth and other human assets in maintaining a

[1] Hadjimatheou (1987) provides a comprehensive survey of the major developments pertaining to the consumption function.

stable ratio of consumption to GDP in the long run. The classic study by Ando and Modigliani (1963), for example, showed that the stock of assets played the role of an intercept term in their estimated consumption function for the US, which progressively shifts the function upward as income levels rise so as to trace out an APC that remains roughly unchanged in the long run.

In contrast to the Ando-Modigliani specification, most of the consumption functions that were subsequently estimated in the macroeconomic literature have employed a log-linear functional form. For such a formulation, a constant long-run APC requires the income elasticity of consumption expenditures to be unity. But the handful of researchers who have estimated simple Keynesian consumption functions for Singapore obtained empirical elasticities that are substantially below one (Wong, 1974; Lim and Associates, 1988, Ch. 16; Toh and Ramstetter, 1994). Implicitly then, the estimated consumption equations allow for a falling APC as income increases[2] without providing an explicit explanation of why it has been declining (the exception is the study by Husain (1995) on Singapore's private savings rate; see below).

Figure 1: The APC in Singapore



[2] Given the nonlinear consumption function $C = AY^{\alpha}$, the APC is $C/Y = A(1/y^{1-\alpha})$. If $0 < \alpha < 1$, the APC will fall as income rises.

Table 1: APC in Selected Economies (Consumption/GDP Ratio)

	1960	1970	1980	1990
Singapore	**0.82**	**0.62**	**0.52**	**0.46**
US	0.64	0.65	0.66	0.68
UK	0.64	0.61	0.63	0.68
Japan	0.64	0.55	0.58	0.55
Hong Kong	0.79	0.71	0.72	0.72
Taiwan	0.67	0.61	0.56	0.60
Switzerland	0.61	0.61	0.63	0.59

Source: Penn World Tables

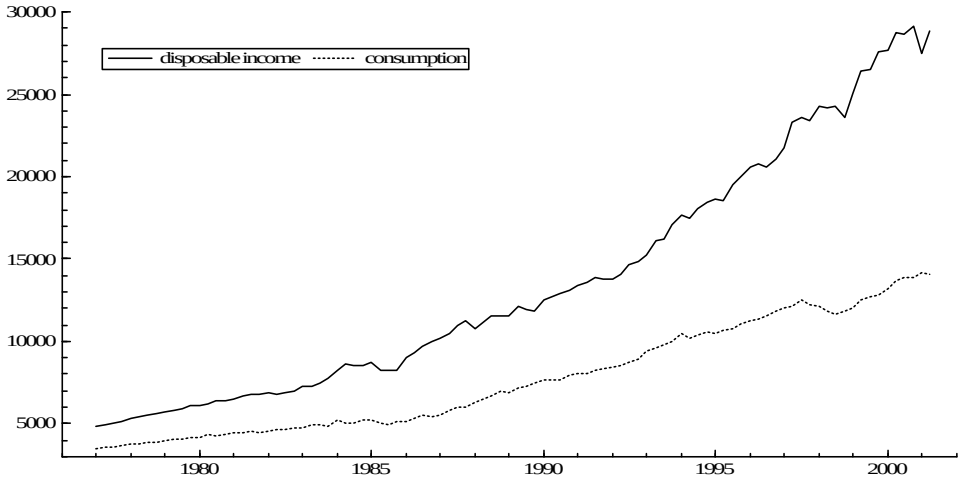
It is the contention of this paper that textbook macroeconomic theories of consumption do not provide satisfactory explanations for the anomalous consumption behavior of Singaporeans. Our efforts to build an aggregate consumption function that incorporates a constant APC as a long-run solution led us to an extensive search for a cointegrating set of variables. We begin this quest in Section 2 by estimating a traditional consumption function that depends on disposable income and wealth and show that it leads to an unstable APC. After reviewing some rather implausible explanations put forward by studies on savings behaviour in Section 3, we provide in Section 4 an augmented econometric specification which seems capable of resolving the puzzle of a falling APC in Singapore. Section 5 draws implications for policymakers and makes some recommendations.

2. The Consumption Puzzle

As a first step in modelling the consumption function, we shall examine the relationship between aggregate private consumption, disposable income and wealth. Singapore's statistical data on private consumption expenditures are not published separately for durable and non-durable goods and services; therefore, we are constrained to model aggregate expenditures without differentiating between these two important categories. Furthermore, data on disposable income and wealth are not compiled and had to be constructed. We first calculate real disposable income as:

$$Y_d = \text{GDP} - \text{Taxes} - \text{Government Fees \& Charges} - \text{Net CPF Contributions}$$

Figure 2: Private Consumption and Disposable Income



where taxes include both direct and indirect taxes and Central Provident Fund (CPF) contributions are net of withdrawals.[3,4] The variables that enter into the construction of the real disposable income series are all expressed in real terms; where necessary, they are deflated by the Consumer Price Index (CPI).

Figure 2 plots real private consumption expenditures and disposable income in Singapore using seasonally adjusted quarterly data beginning from the first quarter of 1977 and ending at the second quarter of 2001. Despite this truncated sample period, it is clear that the long-run paths of consumption and income tend to diverge, giving a clear indication that the two series are not cointegrated (see the result of a formal test in Table 2).[5] Since the omitted variable that is most likely to induce cointegration is household wealth, we followed the method used by the Bank of England (1999) to construct an aggregate wealth variable for Singapore (W_t) which has as its components net housing wealth (HW_t) and financial wealth (FW_t).

[3] The CPF is a mandatory saving scheme with contributions by both employers and employees.
[4] Data on taxes and government fees and charges are only available on an annual basis, so they had to be interpolated to yield quarterly observations. Also, we deducted all types of withdrawals from CPF contributions including those for financing residential properties because these can be thought of as being spent on housing services provided by owner-occupied dwellings, which are in turn included in consumption as imputed rentals.
[5] Unit root tests confirmed that private consumption and disposable income are both $I(1)$ variables.

The Bank of England derives nominal housing wealth in each period by revaluing the previous period's stock in line with changes in house prices. We differed from this procedure only by allowing for depreciation of the real housing stock as follows:

$$HW_t^r = I_t^h + HW_{t-1}^r(1-\delta)$$

where HW_t^r is real housing wealth, I_t^h is real investment expenditures on residential construction and δ is the depreciation rate. Thus, the real housing stock in each period can be recursively calculated by the perpetual inventory method using data on residential construction, an initial stock of S$14,276 million in 1975 (valued at 1985 prices) and an annual depreciation rate of 1.3%, the last two benchmarks being taken from Rao and Lee (1995). The revalued net housing stock is simply $HW_t = P_t^h \bullet HW_t^r$, where P_t^h is the private residential property price index in Singapore.

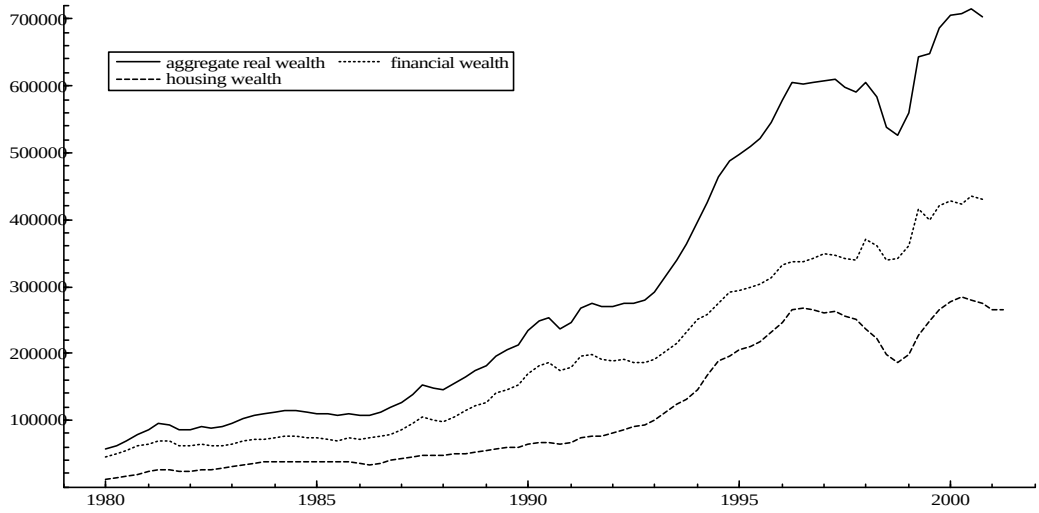
Similarly, financial wealth is constructed by adding to the flow of savings in each period the valuation changes in the financial assets held by households:

$$FW_t = \left(S_t^{CPF} + S_t^{non-CPF}\right) + FW_{t-1} \bullet REV_t$$
$$S_t^{non-CPF} = P_t(Y_{dt} - C_t - I_t^h)$$

where S_t^{CPF} is nominal CPF savings (contributions minus withdrawals), $S_t^{non\text{-}CPF}$ is non-CPF or voluntary savings, computed as the difference between nominal disposable income and consumption plus housing investment, and P_t is the CPI.[6] The revaluation term REV_t is an average of the changes in the 12-month fixed deposit interest rate, stock market prices and the Singapore dollar exchange rate. Net housing and financial wealth deflated by the CPI are plotted in Figure 3: it is seen that the latter has consistently exceeded the former in real terms. The sum of these two wealth components yields aggregate real wealth, another $I(1)$ variable. Figure 3 shows that household wealth grew relatively slowly in the 1980s, picked up sharply in the mid-90's and then fell during the Asian financial crisis before increasing again.

[6] We have used the sum of net CPF balances and the total amount of non-bank deposits in 1975 as the starting value of *FW*. To minimize the distortion this starting value may cause, we have limited our subsequent analyses to observations from 1980Q1 to 2000Q4, which yields a sample size of 84.

Figure 3: Measures of Wealth in Singapore



Using the data series graphed in Figures 2 and 3, an OLS regression of aggregate consumption expenditures on disposable income and aggregate wealth is given by (t-statistics in parentheses):

$$\ln C_t = \underset{(18.2)}{2.19} + \underset{(5.67)}{0.29}\ln Y_{dt} + \underset{(10.1)}{0.32}\ln W_t \qquad (1)$$

S.E. = 0.036 R^2 = 0.992 DW = 0.41

Although the variables have the right signs, the low income elasticity is troubling. Furthermore, the residual-based augmented Dickey-Fuller (ADF) tests for cointegration given in Table 2 indicate that (1) does not constitute a cointegrating relation. It is of course possible that this result is an artifact of our data construction, but we shall demonstrate later that both disposable income and aggregate wealth will continue to play important roles in explaining private consumption when other critical variables are considered. Table 2 also shows that the APC does not behave as an $I(0)$ process, a finding that does not depend on whether quarterly data that covers a shorter time span (1977–2000) or annual data that covers a longer period (1960–2000) are used. [7]

[7] The APC is defined as the ratio of consumption to disposable income in the quarterly series and the ratio of consumption to GDP for the annual observations since the disposable income series cannot be constructed for the earlier period due to a lack of data.

Table 2: ADF Tests for Cointegration

Lags	0	1	2	3	4
Residuals from c on y_d	-2.370	-1.669	-1.403	-1.795	-2.191
Residuals from c on y_d, w	-3.000	-2.803	-2.312	-2.914	-2.654
c-y_d (APC Quarterly)	-1.154	-0.933	-0.901	-1.022	-1.151
c-y (APC Annual)	-1.677	-2.144	-1.760	-1.097	-1.594

Notes: Lower case letters indicate the logs of the variables. Figures are the ADF t-statistics with a constant included; the 5% critical value for the APC unit root tests is –1.94 while the critical values of the cointegration tests based on MacKinnon (1991) are –3.41 and –3.84 for the two and three-variable regressions respectively.

3. Savings and Consumption

At this juncture, it may be useful to briefly review related work that have been done on Singapore's aggregate savings behaviour in order to shed some light on the APC puzzle. Since consumption is the flip side of savings, a rise in the private saving rate will *pari passu* depress the APC. In this regard, at least one study has partly attributed the dramatic increase in the saving rate during 1970–92 to growth in per capita income (Husain, 1995). However, there are two caveats to this explanation.

First, as mentioned earlier, accepted theories of consumption behaviour do not predict a declining APC in spite of income growth, at least not over longer runs of time. Indeed, Kuznets provided evidence to show that the savings ratio in economically developed countries had not changed much since the middle of the nineteenth century despite the large recorded increase in per capita income. The argument that the APC fell in Singapore due to a rise in real income per capita holds water only if we limit the time interval to the 'short run'. However one defines that, we think most readers will agree that the forty years over which the APC had been halved is too long a period to satisfy the requirement.

Second, it bears repeating the stylized fact that many rapidly developing economies – including the high-saving NIEs of Hong Kong and Taiwan – have not witnessed persistent declines in their APCs (Table 1). As we noted earlier, the initial falls experienced by these two countries in the 1960s may have been caused by demographic shifts affecting their working populations. Indeed, demographic change has often been cited as another important factor in explaining the upward trend in Singapore's private saving rate (Husain, 1995; Monetary

Authority of Singapore, 1993). In particular, it was argued that the sustained period of growth experienced by Singapore coincided with a significant fall in both young and old dependents in the population. But the available data suggests that if this had any role to play at all in explaining the APC, it cannot be beyond the mid-1980s, when the ratio of the working age population to the total population stabilized at 0.7. Yet the APC has continued its precipitious decline ever since.

In a provocative article, Ermisch and Huff (1999) claimed that forced saving in Singapore – extracted through compulsory CPF contributions and the manipulation of the internal terms of trade by the major statutory boards providing utilities and telecommunication services – have been responsible for the high savings rate and hence for "spectacular drops in consumption as a share of GDP" (p. 30). But it will do well to remember that private consumption as a share of disposable income, and not just GDP, has also been falling. Given the way we have defined disposable income, this suggests that rising CPF contributions and government fees and charges could not have been behind the APC's decline. For the same reason, high personal income taxes are not a feasible explanation; as a matter of fact, tax rates have actually been progressively reduced. However, increases in the CPF contribution rate, by reducing disposable income, might have induced people to save more for precautionary purposes i.e. to meet unexpected contingencies. We tested this by inserting the CPF rate into the traditional consumption function; despite having the right (negative) sign, the effect was statistically insignificant.

Another potentially important determinant of savings behaviour which has not been considered by the foregoing studies is the rate of interest (Blinder and Deaton, 1985). In theory, the after-tax real interest rate is the relative price that influences intertemporal substitution between present and future consumption. Since it is difficult to calculate the effective tax rate on interest income in Singapore, we merely investigated the sensitivity of consumption to nominal and real interest rate changes. The former is represented by the Prime Lending Rate (PLR), a benchmark for loan rates, while the latter is obtained by subtracting from the PLR the annual inflation rate – a crude but convenient proxy for expected inflation. Interestingly, we found that both nominal and real lending rates have significant negative effects on private consumption but incorporating them individually into the consumption function in (1) does not yield a cointegrating relationship. Similarly, the "Deaton effect" (Deaton, 1977) hypothesizing that inflation surprises lead to decreases in consumer spending is not borne out by the data; on the contrary, inflation was found to have a positive and significant effect on consumption. The answer to the Singapore consumption puzzle has to be sought elsewhere.

4. Explaining The Puzzle

The analysis in the last section suggests that an explanation of the long-term decline of the APC must begin with an attempt to understand why the traditional cointegrating relationship between consumption, income and wealth broke down in Singapore. The question is: can additional variables be found such that when they are included into the standard consumption function, a stable long-run relationship is recovered from the data? And if so, will the same cointegrating variables explain the secular fall in the APC?

A Plausible Explanation

We made the conjecture that the missing variables are related to asset price inflation in Singapore in the form of the dramatic increases in house and car prices seen in the last two decades.[8] The skyrocketing of physical asset prices can be attributed to the limited land space, the rising aspirations of the population to upgrade to better housing, and the demand for cars outstripping the supply of quotas for car ownership. Although these price increases might have had the usual positive "wealth" effects on long-term home and car owners, they are also likely to have generated negative "price" effects on the segment of the population who had just bought, or were planning to buy, a residential property or a vehicle. Specifically, house and car buyers (and upgraders) could have been deterred from spending on non-durable goods by higher mortgage payments or car loan instalments as the case may be, thereby depressing consumption in the aggregate.

In the light of this hypothesis, we introduced the logarithms of residential property prices into the aggregate consumption function. It turned out that when this was done, the coefficient on property prices came out with a positive sign; as this variable also captures the wealth effects of house price fluctuations, it is not surprising that the aggregate wealth variable loses its significance. Moreover, no signs of cointegration can be found. Similarly, car prices were found to be positively correlated with private consumption, whether or not property prices were taken into account. It is in general not possible to estimate both wealth and price effects using the same variable; what is needed is another variable to proxy for the price effect.

[8] These increases have resulted in house and car prices that are many folds greater than the average annual household income.

Next, we tried using withdrawals from the CPF to pay for purchases of houses as the proxy for the price effect. The increase in such withdrawals have been particularly rapid in the 1980s, having grown from 2.8% of disposable income in 1977 to 6.4% by 2000; as a proportion of CPF contributions, they have averaged about 40% during the 1990s. In a sense, housing withdrawals also serve as a proxy for financial liberalization, which has won favour with some researchers as an important explanation of shifts in consumption patterns (see for example Muellbauer and Murphy, 1989). In Singapore, withdrawals from the CPF to pay for publicly built flats have been allowed since 1968; subsequently in 1981, the rules were liberalized to cover private residential properties.

As housing withdrawals reduce the stock of CPF savings – a large component of household wealth – they are also expected to have a direct and negative wealth effect on consumption, in addition to the postulated price effect. When introduced in real terms into the consumption function, housing withdrawals were indeed found to have considerable explanatory power over and above the disposable income and wealth variables. As expected, an increase in such withdrawals discourages contemporaneous consumption expenditures, thus suggesting that negative price and wealth effects on consumption from this channel are important. Still, the addition of the variable does nothing by itself to induce stationary residuals.

After some experimentation, we concluded that total visitor expenditures in Singapore, denoted as V_t, is the missing variable in the aggregate consumption function.[9] In principle, this variable should be irrelevant as private consumption is defined as expenditures by the resident population on the final purchases of goods and services. It is obtained by netting out the expenditures of tourists, culled from balance of payments statistics, from the estimates of total consumption in the domestic market. We were led to our conclusion by the fact that the number of visitors who visited Singapore each year is nearly twice the size of the resident population and hence, any errors-in-variables problem created by visitor spending will be amplified. That visitor expenditures turned out to be critical in our regressions is evidence of the presence of a residual element of spending by tourists in the aggregate consumption data.

[9] Total visitor expenditures are obtained by multiplying the number of visitor days by the average expenditure per visitor per day over the period 1985–1998 ($232). We use the period average because expenditure data are only available on an annual basis from 1985 and interpolation of these annual statistics to obtain quarterly figures may introduce substantial measurement errors. Over the period concerned, average visitor expenditure per day has gone up from $190 in 1985 to $314 in 1990 and then fallen steadily to $206 in 1998. Somewhat reluctantly, we have to ignore these fluctuations.

For the period 1980Q1 to 2000Q4, the OLS regression that results when total visitor expenditures are included together with housing withdrawals H_t into the aggregate consumption function is given by:

$$\underset{}{\ln C_t} = \underset{(1.23)}{0.33} + \underset{(11.4)}{0.57}\ \ln Y_{dt} + \underset{(3.33)}{0.10}\ \ln W_t - \underset{(4.40)}{0.05}\ \ln H_t + \underset{(8.42)}{0.19}\ \ln V_t \qquad (2)$$

S.E. = 0.024 R^2 = 0.996 DW = 1.02

ADF t-statistic = –5.081 ECM cointegration test statistic = –4.927

Notice a few things about this regression. First, the estimated coefficient on the disposable income variable is much higher compared to Equation (1) while that on the aggregate wealth variable is correspondingly lower. Second, the improvement in fit is evident – the standard error of the equation is reduced by 33.3% although R^2 is essentially unchanged. Best of all, a cointegrating relationship now binds the variables in (2): the ADF t-statistic for the residuals in a regression with no lags is –5.081, which is significant at the 1% level according to the MacKinnon (1991) critical value. To be doubly sure, we also carried out the ECM cointegration test proposed by Banerjee et al. (1998) based on a dynamic specification of the consumption function in (2) and which is readily available in the PcGive econometric modeling suite. In the event, the test confirmed that a set of cointegrating variables have been found in Equation (2).

Imposing the Unitary Restriction

Although (2) appears to be satisfactory on account of cointegration, it still entails a falling APC as disposable income increases. In order to obtain a long-run steady state with a constant APC, we therefore impose the homogeneity restriction that the slope coefficients add up to one, or $\sum_{j=1}^{4}\beta_j = 1$, so that the income elasticity is given by $\beta_1 = 1 - \sum_{j=2}^{4}\beta_j$. Imposition of this constraint results in the following restricted regression:

$$\ln \frac{C_t}{Y_{dt}} = \beta_0 + \beta_2 \ln \frac{W_t}{Y_{dt}} + \beta_3 \ln \frac{H_t}{Y_{dt}} + \beta_4 \ln \frac{V_t}{Y_{dt}} + u_t \qquad (3)$$

Equation (3) actually has a nice interpretation – the dependent variable is no other than the (logarithm of the) APC while the independent variables are the respective ratios of wealth, housing withdrawals and visitor expenditures to disposable income. If this specification leads to a cointegrating regression, we would have obtained a stable APC in the long run or put differently, a unitary income elasticity *conditional* on constant wealth-income, withdrawal-income and visitor expenditure-income ratios. Since the homogeneity restriction is not supported by the estimates in (2) we had to add a linear time trend to account for a slight downward drift in the residuals of (3). The resulting regression provides:

$$\ln\frac{C_t}{Y_{dt}} = \underset{(17.9)}{-1.97} + \underset{(10.1)}{-0.003}t + \underset{(6.08)}{0.07}\ln\frac{W_t}{Y_{dt}} - \underset{(2.17)}{0.04}\ln\frac{H_t}{Y_{dt}} + \underset{(3.55)}{0.22}\ln\frac{V_t}{Y_{dt}} \qquad (4)$$

S.E. = 0.026 R^2 = 0.943 DW = 1.06

ADF t-statistic = –5.204 ECM cointegration test statistic = –5.6368.

The statistically significant but small coefficient of time trend suggests that there is still some variation in the APC that is unaccounted for by our set of cointegrating variables. Nevertheless, the coefficients of the ratios in (4) have signs and magnitudes that are comparable to those in (2). And once again, the outcomes of the ADF and ECM cointegration tests indicate that we have a cointegrating regression as both the statistics shown are significant at the 1% level.

Despite the superconsistency of the OLS estimators in (4), they could still be substantially biased in our relatively small sample especially in view of the presence of disposable income amongst the regressors. Thus, we employed the 'dynamic' OLS (DOLS) procedure popularized by Stock and Watson (1993) to re-estimate Equation (4) as a check on the robustness of the coefficients. To conserve degrees of freedom, we set both the lead and lag lengths to one quarter. The DOLS estimates for the parameters of interest with corrected t-statistics are (see Hayashi, 2000, pp. 654–657):

$$\ln\frac{C_t}{Y_{dt}} = \underset{(11.0)}{-2.03} - \underset{(2.57)}{0.003}t + \underset{(0.61)}{0.04}\ln\frac{W_t}{Y_{dt}} - \underset{(2.10)}{0.05}\ln\frac{H_t}{Y_{dt}} + \underset{(6.04)}{0.24}\ln\frac{V_t}{Y_{dt}} \qquad (5)$$

S.E. = 0.026 R^2 = 0.948 DW = 0.98

Except for the aggregate wealth variable, the coefficient estimates remain significant even after the adjusted standard errors are taken into account. Notwithstanding the above comments on the OLS estimator, the fact that they do not differ much from their counterparts in the static regression (except for the wealth variable again) indicates that endogeneity bias is negligible. The recursive least squares estimates of the static OLS parameters, depicted in Figure 4 with two standard error bands, also testify to their relative stability during recent times including at the height of the Asian financial crisis.

From the long-run cointegrating regression (4), we are finally able to derive an *ex-post* explanation of the APC's decline. It shows that a 1% increase in the wealth ratio raises the APC by 0.07%, a similar increase in the withdrawal-income ratio reduces it by only 0.04%, while a 1% decrease in the visitor expenditure ratio reduces it by roughly 0.2%. We find these estimates to be reasonable and in line with our prior beliefs about the relative magnitudes of the wealth and price effects. Incidentally, the income elasticity of consumption implied by (6) is 0.75, somewhat lower than the usual estimates found in the literature but higher than the estimate from the unrestricted regression (2).

Figure 5 charts the impact of the evolution of the three key ratios on the APC. [10] The superimposed regression trend line shows that the ratio of financial and housing wealth to disposable income has a persistent upward trend throughout the sample. Thus, the data seem to suggest that a rising wealth-to-income ratio moderated the decline in Singapore's APC, which contrasts sharply with Ando and Modigliani's (1963) finding that the same ratio has been fairly stable in the US. The CPF withdrawals for housing purposes, in contrast, have increased proportionately faster than disposable income, causing the APC to fall. A likely reason for this is the inflation in house prices that was especially apparent in the 1980s before the recession struck and again in the 1990s.

[10] The time trend in (4) appears to capture the impact of a fourth ratio, car expenditure-income ratio. The car prices in Singapore are not only the highest in the world they have also escalated to unbelievable heights. The lack of proper data on car prices and quantities prevents us from assessing the effect of car expenditure-income ratio on the APC.

Figure 4: Recursive Estimates of Parameters

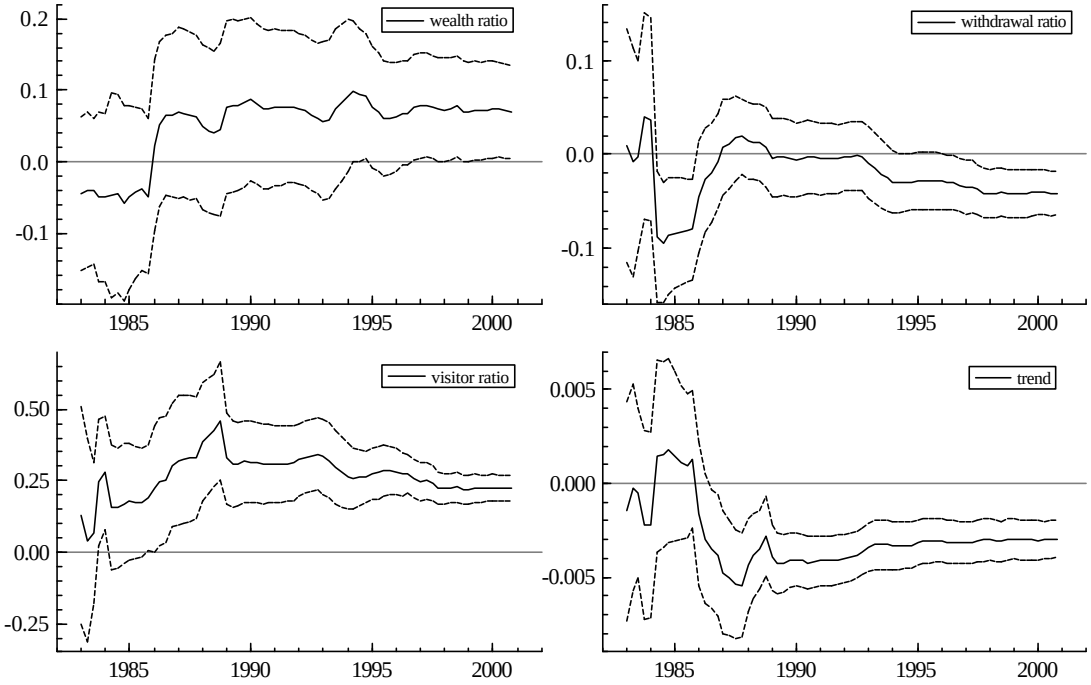
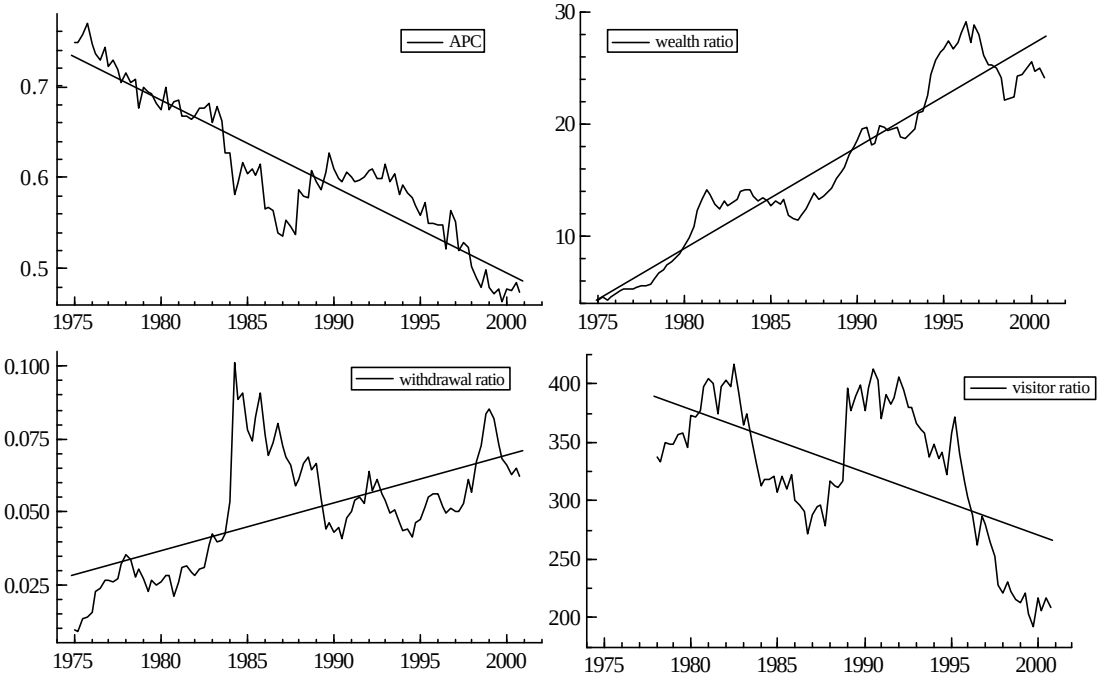


Figure 5: The APC and Key Ratios



Lastly, the ratio of total visitor expenditures to disposable income has also exhibited a decline over the sample period, particularly during the last decade. Since the number of visitors hosted by Singapore has risen steadily over time, the falling ratio is a direct reflection of the drop in average visitor expenditures. This structural trend has inadvertently found its way into the estimates of private consumption, as we explained earlier. However, it is clear from the econometric results that the declining visitor expenditure ratio is the not the sole, or even the most critical, reason for the secular decline in the APC, an observation to which we will return later.

The Consumption ECM

We have so far concentrated on modelling the long-term behaviour of private consumption expenditures in Singapore. But do short-run fluctuations in consumption also respond to the long-run factors that are found to be important? To answer this question and close our analysis, we present below the error-correction model estimated for aggregate consumption, in which the ECM term is simply the residuals defined by the cointegrating regression (4):

$$\Delta \ln C_t = \underset{(4.47)}{-0.71} - \underset{(1.87)}{0.18}\ \Delta \ln C_{t-1} + \underset{(3.42)}{0.28}\ \Delta \ln Y_{dt} - \underset{(2.1)}{0.03}\ \Delta \ln H_{t-1} + \underset{(2.58)}{0.12}\ \Delta \ln W_t - \underset{(4.54)}{0.36}\ ECM_{t-1} \qquad (7)$$

T = 83 S.E. = 0.017 R^2 = 0.363 DW = 1.84

Autocorr. LM(5) = 2.11 (0.07) ARCH(4) = 0.38 (0.82) Normality = 1.18 (0.55)

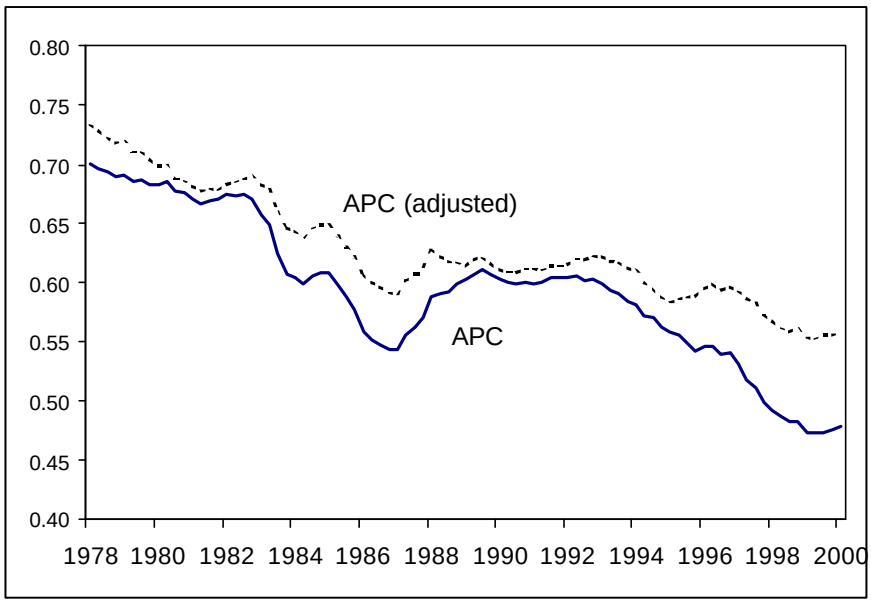
Heteroscedasticity = 0.73 (0.78) RESET = 0.97 (0.33)

The error-correction model speaks for itself but we would like to highlight two features of the estimated equation. First, short-run dynamic effects from the explanatory variables used above, save for total visitor expenditures, are apparent. Second, the estimated parameter in front of the ECM term implies a moderate pace of adjustment to the long run – about 36% of the short-term disequilibrium in the level of consumption expenditures are eliminated in the immediate quarter. The diagnostic test statistics (p-values in parentheses) indicate that the ECM formulation is quite satisfactory.

5. Policy Implications

We conclude this paper by drawing out the policy implications of the foregoing analysis. Before that, it should be emphasized that due to "measurement error" caused by tourist spending, the APC in Singapore is underestimated. Although we do not want to engage in second guessing the published data, we could not resist performing the following counterfactual experiment: assuming that the APC had been correctly measured in the first quarter of 1978, how much higher would it have been if the long-term decline in visitor expenditures was purged from the data? The easiest way to do this is to divide C_t/Y_{dt} by $(V_t/Y_{dt})^{0.22}$ to obtain an adjusted APC, which we plot in Figure 6 alongside the measured APC (four-quarter moving averages are used to smooth out the quarterly data).[11] The discrepancy between the two average propensities to consume is estimated to have widened to 5 percentage points by early 2000. It would therefore appear that the visitor expenditures to income ratio has only been partially responsible for the drastic fall in the APC.

Figure 6: Measured and Adjusted APC
(Moving averages over 4 quarters)

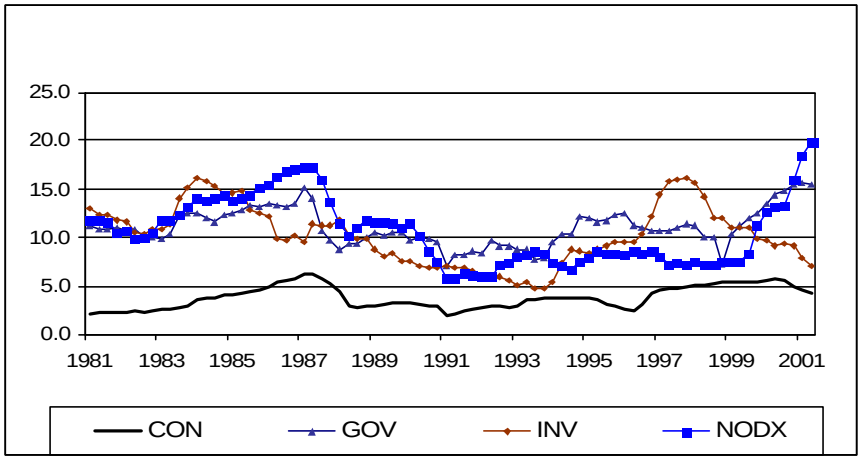


[11] The adjusted APC is derived on the assumption that the true APC was 0.75 in 1978Q1.

Why should the falling APC be a cause for concern? Figure 7 highlights the variability of the four major components of aggregate demand and shows that the most stable component among them is consumption expenditures. With a falling APC, the more variable components in aggregate demand become dominant in determining the cyclical fluctuations in economic growth. Moreover, measures to stimulate consumer spending in Singapore will not be very potent given that private consumption expenditures currently account for less than half of GDP. This conclusion stands regardless of whether one looks at the measured or adjusted APC. In other words, consumption spending cannot serve as a built-in stabilizer for the economy – as it does in many countries – unless the government takes measures to raise the share of such expenditures in output, something not easy to accomplish.

The main result of our exercise is that rising CPF withdrawals to finance housing mortgages must have played a crucial role in the evolution of Singapore's APC, which brings us to another important policy implication: *to halt the decline in the APC, the government should ensure that residential property and other household assets remain affordable to Singaporeans*. At the least, it should do its best to prevent a recurrence of the bubble-like increases in residential property prices experienced in the mid-80s and 90s. As our results demonstrate, these were the periods during which the APC lost much ground. More specifically, we recommend that any increase in property prices that exceeds the trend growth rate of disposable income should be mitigated through policy interventions in order to bring about a stable ratio of property prices to income in the long run. Assuming that the wealth-income ratio increases at its historical rate of about 1% per quarter, the adjusted APC should eventually recover to more sustainable levels.

Figure 7: Variability of Growth Rates of Major Expenditure Components (Moving standard deviations over 16 quarters)



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